

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Naoya Amino et al.

Application No.: 10/590,800 Confirmation No.: 2201

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Examiner: SCOTT, ANGELA C.

For: Rubber Composition for Tire Tread

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner for Patents

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Alexandria, VA 22313-1450

Dear Sir:

I, Naoya Amino, a citizen of Japan, residing at 2-1,  
Oiwake, Hiratsuka, Kanagawa, Japan respectively, sincerely  
and solemnly declare:

1. I am by profession a research chemist and that I  
graduated from Kyoto University, Faculty of Engineering and  
Department of Polymer Science, on March, 1993. Since

April, 1993, I have been employed by THE YOKOHAMA RUBBER Co. Ltd. and have been engaged in research, as a researcher and a manager, especially developments of rubber compositions for pneumatic tires, etc. in the Development Center of The YOKOHAMA RUBBER CO. LTD.

2. In an one of the inventors of the above-identified U.S. Patent Application and also am familiar with the Office Actions mailed November 26, 2008 and May 12, 2009.

3. Experiments

The following Experiments were carried out by me and/or under my direction and/supervision for the purpose of showing the superiority of the present invention over the inventions of Cited References.

The ingredients shown in Table B below, except for the vulcanization accelerator and sulfur were mixed in 1.7 liter Banbury mixer at 160°C for 5 minutes, then an open roll was used to add and mix the vulcanization accelerator and sulfur to obtain a rubber composition.

The resultant rubber compositions shown in

Table B were used, according to a conventional method, to fabricate treads for 195/65R15 size tires and determined the braking distance from an initial speed of 100 km/h on an asphalt road surface. The results are shown in Table B, as indexed to Examples III-2 and III-5, according to the present invention, both in the present specification, as 100. The larger the value, the shorter the braking distance and the better.

The ingredients used in Table B are as follows.

SBR-1: Nipol 9528R (see Note 1) of Table III-2 of the present specification) ( $T_{gA} = -35^{\circ}\text{C}$ )

Rubber gel-X: amount of bound styrene = 27 wt%, amount of divinyl benzene: 0.25 wt%, toluene swelling index = 34, Mooney viscosity = 86, toluene insolubles: 66 wt% ( $T_{gB} = -46^{\circ}\text{C}$ )

Rubber gel-Y: amount of bound styrene = 42 wt%, amount of divinyl benzene: 0.25 wt%, toluene swelling index = 37, Mooney viscosity = 80, toluene insolubles: 64 wt% ( $T_{gB} = -24^{\circ}\text{C}$ )

Rubber gel-1: See Note 3) of Table III-2 on page 35 of the present specification ( $T_{gB} = -31^{\circ}\text{C}$ )

Rubber gel-A: See Note 2) of Table III-3 on page 36 of the present specification ( $TgB = -28^\circ C$ )

Carbon black: See Note 5) of Table III-2 above

Antioxidant: See Note 8) of Table III-2 above

Zinc White: See Note 9) of Table III-2 above

Stearic acid: See Note 10) of Table III-2 above

Process oil: See Note 11) of Table III-2 above. As is clear from Table A, the oil content was the same in all Experiment 1 and 2 and Examples III-2 and III-5 due to the amount of the extended oil in the rubber.

Vulcanization accelerator: See Note 12) of Table III-2 above

Sulfur: See Note 13) of Table III-2 above.

4. As is clear from the results shown in Table B below, wherein the additional Experiments 3 and 4 using SBR-(A) having  $TgA$  of  $-46^\circ C$ , instead of Rubber Gel-1 having a  $Tg$  of  $-31^\circ C$  in Example III-2 of the present application and Rubber Gel-A having a  $Tg$  of  $-24^\circ C$  in Example III-5 of the present application were used, respectively, the desired results cannot be obtained when the two types of the aromatic vinyl-conjugated diene copolymer rubbers

having the Tg difference (i.e.,  $TgA - \delta < TgB < TgA + \delta$ ) of less than 18 degree are used. Thus, in addition to the use of the aromatic vinyl-conjugated diene copolymer rubber (A) having a  $TgA$  of ~40°C to -5°C, the use of the specified conjugated diene-based rubber gel having a  $TgB$  satisfying the following relationship  $TgA - \delta < TgB < TgA + \delta$  is essential for the present invention.

Table 3

Formulation (parts by weight)	Experiment 3* <sup>3</sup> Example III-2* <sup>2</sup>	Experiment 4* <sup>3</sup> Example III-3* <sup>2</sup>
SBR-1	96, 25(26, 25*)	96, 25(26, 25*)
Rubber gel-X	30	—
Rubber gel-Y	—	—
Rubber gel-I	—	30
Rubber gel-A	—	—
Carbon black	80	60
Antioxidant	1	1
Zinc White	3	3
Stearic acid	1	1
process oil	—	11, 25
Vulcanization accelerator	1, 5	1, 5
Sulfur	2	2
TGA (°C)	—35	—35
TGB (°C)	—46	—31
TGA - TGB or TGB - TGA (°C)	11	4
Net braking performance (index)	98	100
	100	100

\*1: See table III-2 on page 35 of the present specification

\*2: See table III-3 on page 36 of the present specification

\*3: Additional Experiment

\*4: Oil content (wt. part)

CONCLUSION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

  
Naoya Amino

Date: this 7th day of September, 2009